S. J. B.

A. M. D. G.

BULLETIN

of the

American Association of Jesuit Scientists

(Eastern Section)

Published at

LOYOLA COLLEGE

BALTIMORE, MARYLAND

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EASTERN STATES DIVISION

Vol. XVI. DECEMBER, 1938 No. 2

SCIENCE AND PHILOSOPHY

TWENTY-EIGHTH GENERAL CONGREGATION, 1938

Sundry Documents, No. 15

Report of Father Wulf and Father Perez del Pulgar on the necessity of combating modern errors scientifically.

1. Some years ago (about fifteen) along with the advance made in physics, chemistry, mathematics, and the experimental sciences, new schools of thought arose in most of the universities of Europe and America, as in England, France, Germany, and Italy. In these centres a distinguished professor with his assistants and students—with elaborate mathematical and experimental resources—investigates scientifically not only the constitution of matter and energy, but also the objective reality of the principle of causality and of natural laws, the truth of ideas—especially of space and time—the certitude of the judgment about the existence of the outer world, in short, pretty much all the philosophical doctrines which we call "natural philosophy", and which are supposed and used in fundamental theology.

These professors and their entourage are nowadays regarded as foremost in knowledge, and many of them because of their scientific writings have been honored in late years with the Nobel Prize.

2. These professors, seeking in their researches only the progress of the sciences and the development of truth through incontrovertible experiments, maintain that they have arrived at new results, which are deemed certain and unquestionable by most scientists of the first rank. These are conclusions like the following:

a) No true, objective certitude about an external world is at all attainable, but only a greater or less degree of probability. The laws of nature (to which seemingly free actions are subject) have no more than a statistical value, and therefore suffer exceptions (Maxwell, Boltzmann, Fermi, Pauli, Ramcan, and others). Hence miracles are never susceptible of proof.

b) The principle of causality affords a useful theory for researches. However, it is only chance that is important in microscopic and ultra-microscopic (atomic) phenomena, and causality plays no part. (Heisenberg, Planck, Born, Jordan, and others). The ap-

parent causality in microscopy is a subjective effect that is fully explained by the calculus of probabilities.

c) Substance—identical with energy—is likewise a mental concept answering to a collection of sensations of some probability. (The concept of transsubstantiation thus vanishes). There is more of the same sort.

3. Not only are these ideas found in scientific books and periodicals, but are spread broadcast in popular literature and thus are learned by a large number of educated people. For example, a book of this type, translated from English into German, ran through an edition in one year though the edition was much larger than an impression of scientific works. Besides, these ideas are accepted by many Catholics as scientifically proved, and this the more because they are advanced with no show of an overt attack on religion, but only as solidly established findings of up-to-date science. In reality, they destroy the foundations of religion—natural as well as supernatural.

4. We must admit, that up to the present no one has appeared, whose mastery of mathematics and of experimental science was equal to the task of disproving in argument the false philosophy in question. What is more, there is grave reason to fear, that none of our philosophers is able even to understand what these scientists say. For this a specialized training and preparation is required, which our philosophers lack.

5. It would seem that the philosophical tendency just described is not a passing phase, but is growing deeper and wider daily, with serious danger to the faith of scientists themselves, but more especially of others who are awed by the learning of the specialists and thus have their faith shaken. Scholastic thinkers too hear of these matters. If such subjects are not even mentioned in our courses of study or in our *Ratio Studiorum*, some might come to look slightingly on our curriculum.

FATHER TH. WULF, S.J.

On Scientific Questions Related to Philosophy

Permit me to subjoin a few remarks to the excellent observations of Father Wulf. Since for some years I was professor of our Philosophers on scientific questions allied to philosophy, I was naturally constrained to make some study of the matter and I have formed my own opinion about it.

I.

The fact stated by Father Wulf is absolutely true, unless I am egregiously mistaken.

a) There is no question here of an author or two of mediocre reputation, but about the foremost scientists of the universities of England, France, Germany, Italy, Switzerland, and so on. It is enough to mention de Broglie, Curie, Perrin, Adhemard, Schrödinger, Heisenberg, Planck, Bohr, Born, Jordan, Dirac, Rutherford, Ramsay, Boltzmann, J. J. Thomson, Compton, Eddington, Pauli, Fermi, Volterra, Levi-Civita, Scherrer, and many others universally known. All of these have discussed the subject from the mathematical or physico-chemical or philosophical aspect.

b) There is no question of a rigorously scientific discussion but of a philosophical one. In this all the results of every kind arrived at up to the present time by the mathematical philosophy are treated, as for example the origin and objective worth of human knowledge and of abstract ideas, especially of space and time; likewise, certitude (empirical of experimental Critica) ; the existence and immutability of natural laws (Determinism) and how physical necessity can be harmonized with a vital and free principle; the concepts of substance, a body, matter and light, i. e. radiant energy).

Now it is undeniable, as I think, that the errors pointed out by Father Wulf in these questions are accepted as scientific demonstrations by most contemporary professors, or at least as the only way yet suggested of explaining the facts. This alone amounts to a vigorous attack on the Catholic faith, but there is more to be noted. Making abstraction from the errors which are now held in honor, the present scientific activity, the entire intellectual movement, which taking its rise in the universities seems to be growing apace, creates a grave danger for the faith and for the Catholic religion, unless it receives somehow inspiration from the sound principles of scholastic philosophy. The danger is all the more menacing, because the men we speak of seem not to be hostile to religion, but only seekers after truth.

c) I am certain that the ordinary course of our philosophers, even with a biennium (unless preceded by a long mathematical and experimental preparation—a rare and chance occurrence) is wholly inadequate not merely to refute the errors in an authoritative and worthy fashion, but even to understand them. I would be delighted to avow myself mistaken, if I could find one of our philosophers, who could understand—for example—the theories on the constitution of matter proposed by Dirac or de Broglie, by Schrödinger or Heisenberg. So it comes about that among the physico-chemical questions related to philosophy appearing in programs so far published, we find it is true, old disputes with atomists who have passed from the scene, or Bohr's corpuscular theories that are now radically altered, and other things which besides being out of date are wholly lacking in importance philosophically. On the other hand, there is not even a word about the undulatory conception of matter, as a solution of

the question of "*Quanta*" (Planck), both in matter (electron, neutron, negatron) and in light (photon); about their transmutations and properties, which while confirming to some degree the ancient principle of the alchemists, also compel us to reject the old molecular concept. There is not a word about essential indetermination (Heisenberg) and about other things of gravest philosophical import, which often are not understood—be it said with all respect—by scholastic philosophers, and professors too, without any fault of theirs.

II.

Perhaps the difficulty in the present matter, as in others too, is this. Formerly, because the natural sciences were undeveloped, the training of young men was uniform: first classical or literary, then philosophical, finally theological. But in our day, when the range of the sciences has increased enormously, schools and curricula of widely differing kinds have been established, that some might become masters in one branch, others in another, seeing that it is impossible for all to excel in all. Something similar, though within narrower limits, perhaps can happen to us. Our young men should have a formation exclusive, primary, and of fairly long duration, that would be fundamentally classical, and afterwards essentially scholastic, in philosophy and theology. This, in our case, is an unavoidable necessity, against which nothing whatever may be done or planned, as is evident. But over and above (as in this very Congregation has been stated repeatedly) we need men skilled and even eminent in other branches for many other tasks. These men cannot be trained, if they do not spend many years more in the study of specialties, or are crushed by the burden of insupportable secondary studies (of no use for the most part).

To surmount this difficulty—at least in the particular case in question (perhaps too in others)—I humbly venture to suggest to the Congregation the following method.

A. On the General Training of Ours.

a) A plan of fundamental studies should be prepared, with exclusive attention to a true and solid formation in classics, philosophy, and theology, subjects that are necessary, making abstraction from secondary sciences.

b) For the secondary sciences required by the Apostolic Constitution, I mean particularly mathematics, physics, chemistry and the natural sciences.

1. A list of questions of real importance in each science should be asked of the respective specialists.

2. When these lists have been thoroughly studied and compared by the Commission on Studies, programs should be made at Rome—

one for each science, and after they have been approved by competent authority, a time should be set within which these subjects are to be treated. (These programs—as time goes on—must be made to keep pace with the growth of science).

3. Specialists are to be given the task of preparing answers to these programs. However, this should be done in a way within the grasp of those who are not specialists, so that the one charged with the ordinary formation of our scholastics may understand it. The decision on this point will rest with the Commission on Studies.

So much for the general training.

B. Touching the detailed refutation of errors mentioned in the first part.

a) Some of our young priests (two or three in the whole Society can surely be found), equipped with some special preparation in mathematical and experimental science, who are loyal adherents of scholastic doctrines and who finally—a condition of first importance—are inspired with a sincerely supernatural desire of defending religion and of freeing souls from error, be chosen to go to these universities. There let them come in contact with the professors in question, work for some time in their laboratories, let them—if possible—make some discovery of their own, so that they may contribute to the periodicals that do not open their pages to all—then at length with fuller knowledge of the ground they will be able to set forth what the glory of God and the defense of the faith seem to demand.

b) Eventually, after the matter is well studied, if it be deemed advisable, an institution might be contemplated, like those already devoted to other specialties (Biblical and Oriental Institutes) where they are cultivated with brilliant success. Thus a school of philosophy could be planned, entitled—for example—"Institute of Natural Philosophy", or by a like name. Here, recent facts and teaching, in some way connected with Scholastic Philosophy and Theology, could be discussed in a truly scholastic spirit. I am convinced that, were this done, not only would the interests of the faith and of scholastic philosophy be promoted, but science too would be greatly helped, for it would have advanced much more and especially would have escaped many errors, had it always been true to the wise and true doctrines of scholasticism.

JOSEPH P. del PULGAR, S.J.

Dedication

With Humble Recognition
Of His Untiring Devotion
To The Cause Of Science

This Number Of The Bulletin
Is Dedicated
To The Memory Of

Rev. Walter G. Summers, S.J.

Professor of Psychology

Director of the
Psychology Department
Fordham University Graduate School
1934 - 1938

Rev. Walter G. Summers, S.J.

Scientist and Philosopher

REV. WALTER G. SUMMERS, S. J.

1889 - 1938

"For if it shall please the great Lord,
He will fill him with the spirit of understanding;
And he will pour forth the words of his wisdom
As showers . . . .

Many shall praise his wisdom
And it shall never be forgotten,
The memory of him shall not depart away."

Eccl. 39, 8 . . .

In the death of Father Summers the world saw the passing of a great and billiant man who was, in the words of a well known jurist, "twenty years ahead of his time". To us who knew him very intimately this involved the loss of a man of exemplary and noble character. His thoughts, his concerns were always of others. No one who asked for help was ever refused. His services, his time and energy, his entire life was at the disposal of others.

Father Summers was predominantly a man of action. His great organizing ability is clearly manifested in the development of the department which he established and whose head and guiding spirit he was until his death. This development from a mere handful of students in 1933 to over a hundred in 1937, from the smallest student body within the Graduate School to one of the largest within a period of four years illustrates a phenomenal growth. He was the only full-time professor in the first year of the existence of the department. In 1938 the department staff consisted of seven full-time and eight part-time professors. From another aspect the growth of his department is indicated by the increase in space and facilities for research. Initially there was but one laboratory and one store room in the Woolworth Building. When the Department of Psychology moved to its new quarters in Keating Hall (Summer 1937), sixteen rooms were allotted for its use. This enabled Father Summers to set up the finest clinical and laboratory facilities in the city. It was ever his idea to establish Fordham as the Catholic Center of psychological research, outstanding in its work and influence throughout the psychological world.

From small beginnings the department, under the guiding hands of Father Summers, grew and developed into an organized unit consisting of five divisions:

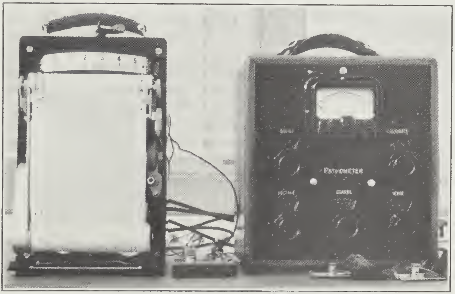
I. Systematic and Historical
II. Experimental
III. Child and Adolescent
IV. Clinical
V. Guidance

Each of these divisions was initiated and organized by Father Summers who first taught the basic courses within each field in order to determine in broad outline the guiding principles to govern the respective sections. His genius, his far-reaching outlook, his broad but comprehensive grasp of the field is reflected in the structure which he built. To mention a specific example we may first consider Father Summers' development of Guidance Work at the University. After contacting various educational agencies and industrial institutions and after consulting the most prominent men in the field of Guidance, he began organizing a staff. During the period of organization two important Guidance Conferences were held at Fordham in 1934 and 1935 under the auspices of the Department of Psychology. The Conferences were so well attended, the character of the topics and the calibre of the speakers so outstanding that the Conferences were acclaimed throughout the nation by professional, educational and industrial leaders. Copies of the proceedings had to be printed and distributed to satisfy the requests of auditors, libraries and institutions all over the country.

Similar organization was initiated in the clinical field. Through his wide affiliations and contacts Father Summers was able to establish centers at various hospitals throughout the city. St. Vincent's Hospital became the first home of Fordham's Child Guidance Clinic which was soon recognized as outstanding in the city. Foundlings' Hospital provided research facilities and training for students in Child and Adolescent Psychology. When the department moved uptown, the Clinic was transferred from St. Vincent's to its new quarters on the Campus. The close contacts which Father Summers kept with the New York City educational authorities are concretely illustrated by the fact that they conduct their Clinic for Children with Retarded Mental Development at Fordham in cooperation with the Department of Psychology. This is official recognition of the work that is done in the clinical field within the department.

Probably no single phase of his numerous achievements attracted such widespread attention and obtained such favorable comment from the scientific, professional and legal world as his invention of the Pathometer, more commonly known as the "Lie Detector". Father Summers was primarily concerned with the investigation of a method for the accurate recording of the physiological concomitants of human emotional reactions. After long investigation and use he had many reasons to be dissatisfied with the accuracy and reliability of the existing forms of electrical, blood pressure and respiratory apparatus,

He was faced with many problems in devising an apparatus and technique both of which would be satisfactory for his work. Here his solid training in physics, physiology, medicine and psychology proved of intestimable importance. The Pathometer which he ultimately devised is a direct current amplifying system which detects, measures and visibly records the minute electrical changes that occur on the surface of the body. The labor Father Summers expended on the development and perfection of this instrument occupied a six-year period of intensive research.



THE NEW PATHOMETER

While this work was going on, Father Summers discovered that in the use of his instrument and technique he could invariably check on the veracity of the reports of his subjects. Out of this developed an investigation into the possibilities of his apparatus and technique for the detection of deception. He modified his emotions technique and finally arrived at a method for the accurate detection of truth and deception. This procedure was finally submitted to a critical test, the object of which was to determine the efficiency of his apparatus and procedure in distinguishing guilt from innocence and complicity. This experiment performed on 271 persons closely approximated a criminal investigation. The results of the experiment showed better than 98% efficiency for the detection of guilt and complicity and 100% efficiency in determining the factor of innocence. Facts such as these reveal the truly scientific attitude which he always manifested in all his work. Before the application of the instrument and technique in actual criminal situations, he had to be certain of its accuracy under circumstances much more trying and much more critical than the testing of criminal suspects. For Father Sum-

mers clearly realized that the emotional factors in a test situation are generally lower and smaller on critical matters than they would be in a criminal investigation.

In actual criminal procedure the efficiency of the Pathometer has been found to be 100%. This result is based upon seventy-five criminal cases which were referred to and tested by Father Summers. Confirmation of the decision in the matter of guilt or innocence of the suspects was obtained either by confession or by the discovery of additional evidence. The cases tested by Father Summers involved various crimes ranging from theft, abduction, assault to murder. Requests for his services came from all parts of the country, from private and public organizations, from city and federal law enforcement agencies.

On March 29th of this year an important precedent was established in the legal history of this country. For the first time the result of a lie detector test was admitted in evidence over the objection of a district attorney. Judge Colden (People vs. Kenny) ruled that the results and record obtained by Father Summers in his examination of the defendant on the Pathometer constituted legal evidence. Father Summers' testimony as an expert witness lasted for two days. The case concerned a boy who had already been found guilty by a previous jury on the charge of committing a holdup. A Mandatory sentence of 40 - 60 years was to have followed because the defendant was a second offender. It was at the new trial, ordered by the Judge, that Father Summers testified after examining the defendant. The Pathometer test revealed the innocence of the boy and this testimony was directly instrumental in bringing about the jury's verdict of not guilty.

So numerous were the requests for the instrument and for instruction in its use that in May 1938 Father Summers conducted an intensive course in the operation of the Pathometer and the technique. The enrollment was limited to selected members of various law enforcement agencies which included only district attorneys and police officials. Because he feared that such an instrument could be exploited if put in dangerous hands, Father Summers restricted the training course to capable and reliable men. A number of these criminal investigators trained under his supervision are gathering a great mass of statistical data and report 100% accuracy in their criminal tests. The instruments are being operated in New York, Michigan and New Jersey.

Despite his work as an organizer, executive and experimentalist, Father Summers found time to write articles and deliver papers before learned societies. The Journals to which he contributed were Thought, Modern Schoolman, Commonweal, Linacre Quarterly and Proceedings of the American Catholic Philosophical Association, Bulletin of Jesuit Scientists. Numerous Articles completed but not

yet published are soon to appear in the legal and psychological journals. Not only has Father Summers delivered papers before such societies as the American Psychological Association and the New York Scientific Society but he was always in demand to head discussions and to act as chairman in various educational and psychological conferences.

Father Summers leaves behind him a monument of achievements. There were, however, some parts of his work which unfortunately and suddenly were cut short by his death. One of his cherished ambitions could not be realized during his lifetime. He had hopes of establishing at Fordham a Catholic Center of Psychiatry. Facilities were not as yet adequate for the continuation of work on this proposal. Two other projects of his remain as yet unfinished—a book on the Pathometer and a book on Systematic Psychology. These have already been outlined and the material was in the process of compilation before his death. All this was abruptly terminated by his death on September 24, 1938.

We marveled at the constructive genius of the man; neither we nor the world can as yet adequately appreciate the full import of his work. But we do know that genius has been among us. And we realize that he died at the peak of his career—a career which held promise of still greater things.

These shall resist the empire of decay
When time is o'er, and worlds have passed away;
Cold in the dust the perished heart may lie;
But that which warmed it once, can never die.

JOSEPH KUBIS, A.B., M.A., Ph.D.

A Tribute to Father Summers

Death has taken a great Jesuit from our midst. We all admired Walter's genius, versatility and scholarship, and we were proud in our hearts at his achievements, but few of us knew Walter as the Jesuit and the man who won the deep reverence, confidence, love and devotion of those with whom he worked.

A letter written to members of the department on the eve of his departure to South America in an effort to regain his health reveals the soul of the true Jesuit. After thanking his co-workers for their generous cooperation, he wrote: "I have placed the Psychology Department of Fordham University under the patronage of Kateri Tekakwitha, the little Indian girl who preserved her love of Christ unsullied and undimmed in a pagan atmosphere. Modern Psychology is the instrument of pagan Philosophy. Our aim is to make it a weapon of Christianity." A picture of the Indian girl standing in front of the wooden cross hung upon the wall of his office opposite his desk.

As a man Walter gave himself wholly to the troubled and anxious souls who sought his help. He would leave off the most absorbing experiment to listen with complete and sympathetic attention to the tale of each. After the interview all felt that Walter had made their problem his own, and they left his office in the confidence that somehow he would find the happy solution.

Requiescat in pace

EDWARD B. BUNN, S. J.

REV. MICHAEL AUGUST ESCH, S. J.

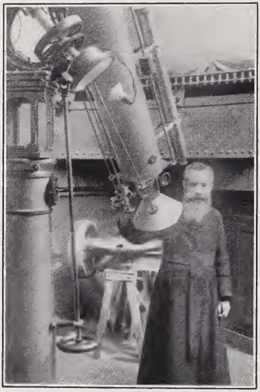
1869 - 1938

Fr. Michael Esch, S.J., Director of the Observatory at Ignatiuskolleg, Valkenburg, Holland, died on April 28, 1938, in his seventieth year.

Michael August Esch was born at Eupen (Germany) on April 12, 1869, the son of a gardner. He made his elementary studies at the Theodosianum in Paderborn, and after a year of study at the Bonn Theological School entered the Society of Jesus in 1891 at

Blyenbeck, Holland. On the completion of his philosophical studies, he passed the years 1896-1898 as assistant to Fr. John Hagen at the Georgetown College Observatory, Washington, where he helped in the preparation of the Atlas Stellarum Variabilium. He developed his own methods for the conversion of Hagen's estimates of steps, which he described in *Astronomische Nachrichten*, 176, 33. Under Hagen's excellent guidance he worked at the observation of variable stars according to Argelander's method. In the fall of 1898, he was transferred to direct the observatory at Valkenburg, where he made

his theological studies at the same time. He was ordained priest in 1901. The year 1903-1904 he spent in part as assistant to Father Fényi at the observatory at Kalocsa. On August 30, 1905, he observed the total eclipse of the sun at Burgos, with the aim of searching for intramercurial planets by means of photography. The results were negative. In 1910-1911 he taught mathematics and physics at the College in Sittard. After a short stay in Switzerland, he studied at the University of Vienna from 1912-1915, and received his Doctorate under Prof. Oppenheim with a thesis on the problem of three bodies. Then from 1916-1918, he taught Astronomy and Physics at the Institute for Scholastic Philosophy, at the University of Innsbruck, and finally returned to Valkenburg.



Beginning in March, 1899, Fr. Esch confined himself almost exclusively to the study of variable stars, principally those long-period stars whose entire range of light change he could follow with the 23 cm. refractor of the observatory. Besides his numerous "Notes" and "Communications" in the *Astronomische Nachrichten* (the last of which was dated Dec. 3, 1937), he began in 1930 his own publications, which were to comprise his 30,000 observations of about 500 variables from 1898 to the present. After a clear description of instrument, program, comparison stars and method of observation, the first part contained 112 stars, for which long series of observations were at hand. For each variable he added the principal phases, and notes on the light-curve and period. The second part, beginning with Volume

7 and now unhappily broken off, was to contain mainly those series of observations made between 1918 and 1935, which were not to be continued.

In the meanwhile, Fr. Esch continued as collaborator on the Atlas Stellarum Variabilium, and had a special part in the publication of Series VII. and VIII., after Fr. Hagen had turned his principal activity to the field of cosmic nebulae. In recognition of this service, he was named Honorary Astronomer of the Vatican Observatory by Cardinal Maffi, at that time President of the Observatory.

Fr. Esch was a born observer, who with tenacious persistence produced excellent results, often under very unfavorable conditions. He had to observe in a climate, where, from his own experience, "the nights were completely overcast for three-fifths of the year, and of the rest only half were cloudless". So he observed if it were at all possible. He stayed up every night, so that no clear space between the clouds could pass unused. A critical judgment, scientifically precise accuracy and the methodical character of his work characterized his astronomical activity. Constantly ready to help, his sterling judgment could be depended on with perfect security.

Since 1904, Fr. Esch was a member of the Astronomische Gesellschaft, and belonged from its beginning to the Commission on Variable Stars. He enjoyed attending the meetings of the society, where his good-natured, simple, kindly ways won him many good friends. The condition of his health prevented him from attending the Breslau meeting in 1937. Heart trouble, which for several months had kept him from work at the telescope, brought to an end his meritorious life. R.I.P.

JOHN STEIN, S.J.

(Translation of an obituary notice in *Astronomische Nachrichten*, 266, 47, June 4, 1938.)

THOMAS D. BARRY, S.J.

REV. JOSE CORONAS y VOERA

1871 - 1938

Father Coronas died suddenly in St. Paul's Hospital, Manila, at 3:05 P. M., June 5, 1938. His long service in the Manila Observatory makes his life of special interest to the readers of the Bulletin. He was born in Barcelona, Spain, on January 8. 1871, and entered the Society on September 30, 1886. After finishing his philosophy he was sent to Manila, where he arrived on August 19, 1894, and was assigned to work and study in the Observatory. Here he had the tutelage of Fathers Faura and Algue, the first two Directors of the Observatory.

Father Faura died in January, 1897, and the supervision of the meteorological section devolved on Father Coronas under the direction of Father Algue. During these years he wrote monagraphs on an eruption of Mayon volcano and the seismic activity of the Philippines during the year 1897. He experienced the stirring days of the first Philippine Revolution, the Spanish-American hostilities and the Filipino-American warfare. A tradition grew up in later years that Father Coronas saved Dewey's fleet from wreck or damage by a timely typhoon warning but this is just pure fiction.

On September 3, 1901, Father Coronas returned to Barcelona and, partly at his own suggestion to Superiors, was sent to St. Louis for theology where he would have an opportunity of perfecting himself in English. He was ordained by Archbishop Glennon in 1904 and made his Tertianship at Florissant. The summer of 1906 was passed in Washington, D. C. where Father Coronas familiarized himself with the methods and routine of the Weather Bureau. He then returned to Spain and pronounced his last vows in the church of the Sacred Heart in Barcelona on February 2, 1907. A few days later he took ship for Manila, arriving there on March 9. Once more he entered the Observatory which had now become the Central Office of the Weather Service of the Philippines and assumed the position of Chief of the Meteorological Division. This was the beginning of a continuous term of service of twenty-four years.

The high reputation which the Manila Observatory enjoys in the shipping circles of the Far East and among the observatories of the world for its typhoon service is due in most part to the unremitting and conscientious work of Father Coronas from 1907 to 1931. During these years he made regular typhoon reports which were published in the Monthly Weather Review, wrote special reports for

the Bulletins of the Observatory and compiled The Climate and Weather of the Philippines which is still in demand.

During most of these years in the Observatory he was troubled with a throat ailment which finally forced him to retire and spend two years in New Mexico and Arizona in an effort to recuperate. He was greatly benefited by this change and on returning to Manila in August, 1933, he was attached to the Ateneo de Manila and gave all of his time to the confessional, the spiritual direction of the nurses of the Philippine General Hospital, instructions and the organization of students' retreats. He was placed in charge of this phase of preparation for the XXXIII International Eucharistic Congress and organized more than a dozen retreats in and around Manila, each of which was atended by from 500 to 1000 students.

For the last ten years Father Coronas had been troubled with hernia and after much consultation decided to risk an operation. This was successfully performed on May 10th, and he was recovering from this satisfactorily when complications set in. He seemed to be overcoming these but began to sink rapidly at 3:00 P. M. on June 5th. Father Vincent O'Beirne, who was in the hospital, was hurriedly summoned and anointed Father Coronas just as he was breathing his last at 3:05. The doctors believed that a blood clot was the cause of death.

The body lay in the chapel of the Ateneo on Monday and a continuous stream of friends filing into the chapel all day and evening testified to the esteem in which Father Coronas was held. All of the leading papers carried laudatory editorials.

The Office of the Dead and Mass were celebrated at 6:45, June 7th, and the interment was made in the cemetery of the novitiate at Novaliches.

WILLIAM C. REPETTI, S.J.

BIOLOGY

CELL GROWTH AND DIFFERENTIATION IN TISSUE CULTURE

Philip B. Carroll, S. J.

This paper was an attempt to correlate some of the many fragments of scattered data on the subject of animal tissue culture and orientate them into a survey of the progress made especially in cell growth and differentiation since Harrison's first successful experiments in 1907. It treated also of the methods employed in preserving tissue in vitro and the nature of growth-promoting substances.

(1) The process of growth, (2) the mechanisms by which cells differentiate into tissues of various forms and functions and (3) the relation between the two, remain among the outstanding problems for future research. Tissue culture, however, and the study of cells as living, changing units, constantly varying in character and composition in response to environmental changes, have done much toward a solution in opening many new and promising channels of investigation.

THE ADAPTATION OF PARAMECIUM TO SEA WATER

Rev. John A. Frisch, S. J.

(Abstract)

In cultures of hay and wheat infusions, in which the concentration of sea water was gradually increased by evaporation, many individuals survived and divided until a concentration between 35 and 40% was reached; all died before a concentration between 50 and 55% was reached. Daily observations of a culture, in which the concentration of sea water increased to 40% in 20 days, showed that the average rate of pulsation and the average rate of feeding were lower, day for day, than in fresh water cultures; that both rates varied from day to day as in fresh water cultures; and that the rate of pulsation varied with the rate of feeding, increasing or decreasing

from day to day, as the rate of feeding increased or decreased, just as in fresh water cultures. As the salt concentration increased, the animals decreased in length and volume, and became emaciated. Addition of nutrient medium, or of bacteria, to the cultures, always resulted in an increase in the number and in the volume of the individuals, and in the rate of feeding and the rate of pulsation, except when the concentration of the seawater had reached 40%. The data indicate that the decrease in the rate of pulsation is not due to the increase in osmotic pressure of the medium, but to the decrease in the rate of feeding; that the decrease in the rate of feeding is due to a shortage of bacteria in the higher salt concentrations; that death is due to an increase in the viscosity of the protoplasm, and to other toxic effects of the salts, taken in by the cytostome, which result in the vacuolization of the protoplasm of the animal.

CHEMISTRY

ACTIVE HYDROGEN IN ORGANIC MOLECULES

Rev. Richard B. Schmitt, S. J.

(Abstract)

Structural formulae, as found in the literature of organic chemistry, are taken for granted, and professors and students seldom realize the difficulties envolved in establishing these formulae. Furthermore, only few research workers have opportunities of actually determining the structural formulae of unknown compounds. This type of research is a long and tedious process, which requires careful planning and most exacting experimental work. It might be recalled, that R. R. Williams and his co-workers spent about twenty years in establishing the composition and structural formula of vitamin B_1; and there are other similar examples.

We wish to briefly record our experiences with the micro determination of active hydrogen in organic molecules, with known and unknown substances.

History.

In 1902 Tschugaeff (1) observed that magnesium alkyl halides of lower molecular weights react with carboxyl and hydroxyl groups and produce a gas. About five years later, Zerewitinoff (2) showed that the corresponding hydrocarbon is formed; and he used this reaction for the quantitative determination of active hydrogen. Hibbert and Sudborough (3) noted the great affinity of magnesium methyl iodide for oxygen and water.

$$CH_3\ Mg\ I + O = CH_3\ O\ Mg\ I$$

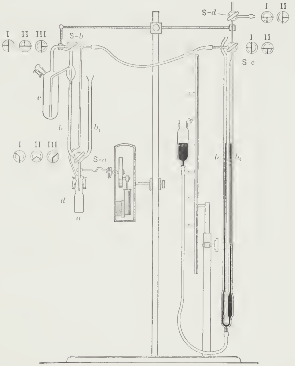
$$CH_3\ Mg\ I + H_2\ O = CH_4 + Mg\ I\ OH$$

This fact showed the cause of experimental difficulties in carrying out the determination.

In 1925 Flashenträger (4) devised a micro method of active hydrogen determination, in which the Grignard reaction was carried out in an atmosphere of air. Meisenheimer and Schlichenmayer (5) showed quantitatively the sensitivity of magnesium methyl iodide to oxygen, and proved definitely that it was necessary to perform

this reaction in the presence of an inert gas. Then in 1930, P. Marrian and G. Marrian (6) successfully completed a micro-method of this determination using nitrogen. The nitrogen used was pure, containing less than 0.2% oxygen.

Finally in 1936, Arnulf Soltys (7) constructed an apparatus which eliminated all the features which caused experimental errors in previous set-ups.



In the diagram: *a* is the reaction flask or methane generator; b_3 and b_4 is the methanometer; *c* the flask containing the Grignard reagent.

Principle.

Active hydrogen in this micro method includes the following groups:

OH COOH NH NH_2 H_2O

Organic molecules containing one or more of these groups, when they react with Grignard reagent they produce methane.

$$CH_3\,Mg\,I + R\,H = CH_4 + R\,Mg\,I$$
$$CH_3\,Mg\,I + R\,OH = CH_4 + R\,O\,Mg\,I$$

The success of the experiment depends upon the accuracy of measuring the amount of methane generated by the sample.

Reagents.

As in all micro quantitative determinations the reagents must be exceptionally pure. The nitrogen, which is constantly going

through the apparatus, before, during and after the experiment, should be 99.9%. In order to keep the nitrogen absolutely dry, it should flow through a mercury valve bottle, then into a wash bottle containing concentrated sulfuric acid, and finally through a U-tube filled with anhydrone.

The best solvents for the experiment are anethole or pyridine. Anethole can be purified by distillation and stored in a dry glass-stoppered bottle over potassium. Pyridine is an excellent and almost universal solvent for this work. It should be redistilled in vacuo, shaken with barium oxide, and quickly filtered. Then add several lumps of dry barium oxide and allow to stand for several days.

For the preparation of Grignard follow the directions carefully as found in organic manuals or as described in Niederl's book. (8)

Procedure.

The reaction flask should be cleaned with ethyl alcohol 95%, then with dilute hydrochloric acid and finally with acetone. The pipette which is to be used for measuring the solvent, e. g. pyridine, and the cleaned reaction flask should be dried in an oven at 100° C for fifteen minutes. This can be conveniently done while weighing out the sample. It is necessary to run a blank test each day before making determinations, because the values vary from day to day.

The detailed procedure follows:

1. Determination of the blank.
2. Weigh out the sample; place sample in *warm* reaction flask.
3. Add 0.5 ml Pyridine with *warm pipette;* attach reaction flask.
4. Nitrogen is passed through the apparatus for 10 minutes. Stop-cocks in this position: Sc I, Sa III, Sb I.
5. Fill Grignard Burette, if necessary.
6. Adjust b_3 and b_4 to the zero point; close the system: Sc II, Sa II, Sb I, Sd I.
7. Add about 0.8 ml Grignard solution.
8. Shake at room-temperature for 5 minutes.
9. Bring b_3 back to zero; and read b_4 i. e. volume of methane.
10. Lower Hg and shake at 100° C for 10 minutes; immerse reaction flask in hot H_2O.
11. Shake at room-temperature for 10 minutes; bring b_3 to zero and read b_4.
12. Read Grignard burette.
13. Lower Hg again; add 0.6 to 0.9 ml aniline; Sa III.
14. Shake for 5 minutes and read again.
15. Calculation.

Sample Calculation.

2.72 ml volume methane	.90309	factor for methane
1.27 ml Grignard	.04594	factor for t & p (vap. p of pyridine).
——	.89763	log vol. methane
1.45 ml	.57187	neg. log Wt. sample
0.66 blank	———	
——	.41853	= 26.2% methane
0.79 ml net volume methane	Theor.	= 26.1% methane

Results.

Active Hydrogen.

Substance.	Wt. mg.	Methane Room temp.	Methane after 100°	Grig.	% found	% theo.	Act. H
Benzoic acid	2.72	1.62	1.84	0.80	12.2	13.1	I
Benzoic acid	4.73	3.91	4.95	0.89	11.1	13.1	I
Resorcinol diethyl ketone	2.87	1.70	1.85	1.29	26.2	26.1	II
Cholesterol	4.72	1.61	1.79	0.86	4.05	4.15	II
Salicylic acid	0.87	1.53	1.76	0.76	21.8	23.1	II
Vitamin B_6	1.17	1.75	1.87	0.87	33.76		
Vitamin B_6	1.31	1.76	1.94	0.88	33.27		
Vitamin B_6	1.38	1.72	1.95	0.90	31.61		

Note 1: A sample of 10 mgs. of vitamin B_6 was donated to the N.Y.U. laboratory by the Merck Chemical Co. The present price of vitamin B_6 is approximately a thousand dollars a gram.

Note 2: The permissable error in this experiment is 3 to 5%.

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PHOTOGRAPHIC NOTES. PART II.

REV. JOHN A. BROSNAN, S. J.

The making of slide-size negatives has already been described, quality of plates for different subjects, exposure, view point and fixing. Don't waste time on a poorly defined negative; and a much underexposed plate is nearly as hopeless. If the underexposure is suspected before development, special treatment may save the negative. A developer, which will coax everything out of an exposed film, has been worked out in the Eastman laboratories. But it will save time to reject both blurred and underexposed negatives. Slides made from them will be a source of continual regret.

One special exposure deserves explanation. It may be necessary to make a slide of a black-line map or diagram printed on white paper, 24 inches or more on the side. The lines in a well-made map are rather fine, varying from 1/50 to 1/100 of an inch in width. If one were to make a negative, slide-size, directly, of such a diagram, these lines would be brought down to 1/8 of their width, showing on the ground glass and sensitive plate as very thin black lines, 1/800 of an inch wide, surrounded by a flood of white light. Now when the light waves beat on the emulsion of a sensitive plate, they do not merely sweep through the film perpendicular to the plate or in clean straight lines, but they also act laterally, due to the scattering action of the silver halide particles in the emulsion. So we should have a thin black line, say 1/500 inch wide, on the surface of the plate, attacked on both sides by surging lightwaves. Moreover some of the light which penetrates the film is reflected from the back of the plate and these new waves tend also to flood the defenseless line. This last effect, from reflection, with a given illumination on the subject and a given transparency of film will vary with the thickness of the emulsion carrier, being greater with thick glass and less with thin celluloid; it may be avoided to a great extent by "backing" the plates. But the lateral light action, more fatal to very thin lines or small dots, will always take place.

A solution of the problem seems to be this: Do not reduce the diagram to slide-size directly; make it at least 6 inches square and for the negative use a "cut film", process speed. Give a correct exposure and develop just to the point of shading the lines which should be clear on the negative; then bring the large negative down to slide-size by camera reduction.

Let us now suppose we have a set of negatives, all of proper size for slide making by contact printing. These negatives must be sorted for treatment. Variation in exposure time, changes in intensity, if one uses daylight, difference in temperature of the developer, use of the wrong plate, all help to give negatives of different strength. We may have three classes; very dense, normal and weak or flat.

Flat negatives will not easily give good slides. Some time ago the only remedy for a negative of the weak class was "intensification", an increase in contrast by chemical means. Now, however, before intensifying a negative, make use of the help given by the lantern-plate makers. The Hammer Company makes two grades of lantern plates, normal (yellow label) and slow (white label), the Eastman stores supply three grades, soft, normal and hard. For slide-making from very dense negatives use the "soft" plates, from good negatives use normal plates and from weak negatives use the "hard" or contrast plates. Still some negatives may be too weak to give good results even with the contrast plates; these negatives must be intensified (directly or indirectly). A very efficient intensifier (two solutions) is the following.

A —	Mercury bichloride		500 grains
	Ammonium chloride		500 grains
	Water		30 fl. oz.
B —	Ammonium hydroxide	(conc. sol.)	1 fl. oz.
	Water		8 fl. oz.

For actual work fill an 8-oz. bottle with solution A and use it over and over until it becomes clody and weak. Solution B also may be used several times, until its action becomes slow.

Procedure: Be sure that the negative to be treated has been properly "fixed" and washed, otherwise staining may result. Immerse the dry negative in 6 oz. of (A) and rock until the black silver deposit becomes white; remove the plate and place it in running water for at least five minutes. Then put it in another tray which contains (B). Rock the tray till the whitened image turns black, remove the plate and wash for 3 or 4 minutes and place on drying rack. If the weak negative is very valuable and cannot be replaced, do not intensify by this method, for the life of the negative is usually shortened.

Try this way: make a slide from the weak negative, by contact printing, on a contrast plate, intensify this slide, using the mercury intensifier, and from this finished strengthened slide, make a negative by contact printing, on a process plate. Intensify this last negative in the usual way and it will surely be hard enough to give a good slide, and the original weak negative will be saved from premature decay.

Natural object negatives may have another fault, less common than weakness. Some parts of a negative may be altogether too dense, so that a slide must be overprinted (and spoiled) in the shadows before detail appears in the high lights. This is more apt to occur with slow plates and underexposures. To make the negative printable, the very dense parts must be weakened. This cutting down of the strong silver deposit is called "reduction". Fortunately there are two classes of reducers: one destroys the faint deposits

first, increasing contrast; the other, more useful, attacks the strong parts in preference, diminishing contrast. Both reducers should be used with caution, as it is nearly as easy to ruin a negative as to improve it. A good example of the first type is Farmer's reducer, its ingredients being potassium ferricyanide and ordinary plain "hypo". Potassium ferricyanide does not keep well in solution, so it is best to dissolve it when needed, and as the amount to be used is small and only "approximate", the weighing balance may be dispensed with. Add enough of the salt to 3 oz. of water to make a light-beer colored solution; mix this with the same volume of plain "hypo" (fixing bath strength), pour into a tray, immerse the wet negative and rock the tray to insure evenness of action. Watch the weakening action carefully and just before it "looks right" remove the plate, wash it well, place it in the fixing bath for a minute or two, then leave it in running water for ten minutes, when it will be ready for the drying rack. The second reducer, for lessening contrast, is made up as follows:

Ammonium persulphate	100 grains
Water	10 fl.oz.
Dilute sulphuric acid (reagent strength)	30 drops

This solution is not stable; it should be made up just before using and should be thrown away after the operation.

Immerse the clean wet negative in a tray containing 6 or 8 oz. of this solution, rock the tray and remove the plate frequently for examination by transmitted light. Just before the reduction seems complete, place the treated negative immediately in the acid fixing bath for two or three minutes, then wash it well for 10 minutes and allow it to dry. Both of these reducers, as described, are weaker than usual and consequently slower in action which is a good thing for most users, since the "end-point" will not come with unexpected suddenness. There are other reducers and different combinations, making what is called a proportional reducer giving uniform lessening of density without materially changing the contrast. This particular solution is not needed for our use, since a longer exposure when printing the slide will have the same effect as thinning down the negative.

It may be necessary to strengthen one part of a negative without affecting the rest; such intensification is termed "local". This process calls for brushes and the ordinary intensifying solutions mentioned before. Ordinary camel hair will answer very well; but have nothing to do with quill handles—buy wood-handled brushes, No. 1 for small work; No. 4. or No. 6. for rougher touches. To intensify locally, have a small amount of the bichloride of mercury solution in a shallow cup, the dry negative lying face up on a sheet of glass, 11" x 14", double thickness, supported almost horizontally, about 8 inches above a white reflecting surface. At the proper dis-

tance above the negative and parallel to it, set a 3-inch reading glass (2 mag.) in a ring-stand clamp; this will help the eye to guide the brush. Dip the small brush in the bichloride solution and begin the painting with the edge of the area to be treated, pressing the brush on the film gently and with a small circular motion. Be sure not to work the brush too long in one place, especially if the weather is hot and damp, for the brush point may cut through the film and ruin the negative. The bichloride solution will whiten the silver deposit and when all the parts to be locally intensified are painted with the mercury salt, hold the plate under a strong quick stream of water for a minute or so, to wash off the excess bichloride and prevent it from overrunning its place. Then leave the plate in a tray of running water for about 10 minutes, and change to a tray of the regular ammonia solution. The whitened parts become a strong black; the other parts are not affected by the ammonia. Then remove the plate, wash for five minutes and set aside to dry.

We have already spoken of the reduction of the strong parts of a negative, in preference to the weak, by a general application of an ammonium persulphate solution. By "local reduction" here, we mean the complete elimination of silver deposit, strong or weak, from selected parts of the plate. Use the same horizontal support, magnifying glass and brushes as before; make a small amount of potassium ferricyanide solution (about ½ oz), strong enough to have the color of light beer; to this add ¼oz. of fresh plain Hypo solution (negative strength). With this mixture, paint over and over again on the dry negative, the parts of the silver deposit to be "cut out", and try to do the work without waste of time, or the ferricyanide may produce undesirable stains. When the required disappearance of silver has been effected, hold the plate for a minute under a strong water stream, immerse for a few minutes in the plate hypo, wash for ten minutes and set aside to dry.

If we wish to thin down some dense parts of a negative and leave the other dense parts untouched, here is a simple process. Make a solution of good white paraffin (biological) 15 grains in 1 fl. oz. of benzene (not benzine); have the negative perfectly dry, and with a clean water-dry brush spread the solution carefully over part you wish to remain unchanged. Allow the excess benzene to evaporate and place the treated negative in a weak Farmer's reducer. The paraffin-coated parts will not be touched; when the uncoated part is sufficiently reduced, wash the plate, place it in the hypo for a few minutes, wash for 10 minutes, allow to dry (without added heat) and with a tuft of raw cotton wet with benzene, swab off the paraffin, and the operation is safely carried out.

A few words about "spotting" and "blocking-out."

To carry out these operations properly, one should have a "retouching stand", which will be used later on for a coloring stand also.

This consists of a horizontal wooden base, about 11" x 14", covered with white cardboard; a frame, same size, hinged to the base and raised to an angle of 45°, carries an 11" x 14" piece of heavy glass. The negative to be treated is placed on the sloping glass plate, with the ring-stand magnifying glass ready if needed. The negative may have pinholes, larger defects, text or other diagrams not wanted on the slide; these must all be blocked out. The most convenient blocking medium is Gihon's Opaque, to be applied mainly to the film side of the negative. Uncover the opaque cake, wet its surface with water and "work it up" with a brush until the mixture is thick enough to leave an opaque mark over a scratch on the film. Do not make the "paint" too thick, for it may "craze" on drying, and besides it might prevent good contact between the negative and the positive plate in the actual slide printing. Cover all the defects, unnecessary text, etc., with a thin smooth layer of opaque; and when the work has dried, examine it for drying cracks and retouch. If the blocking out must run very close to any line, regular or irregular, it is difficult to make a neat or accurate "fit" with a thick material like opaque. In this case use a concentrated solution of Methyl Orange or Tropaeolin Orange in water, with a few drops of grain alcohol added to help the solvent power. With the aid of the magnifying glass, and using a nicely pointed, well-filled brust, one can with a little practice lay the color exactly in contact with any line straight or curved. Once the "fitting" has been made with the orange dye, "opaque" may be used for the rest of the job.

Sometimes it may be convenient or necessary to put on one slide 3 or 4 diagrams from different parts of the same book; the book should not be spoiled by cutting out the pages and making one "copy", so the proper method is to take separate negatives and group them for camera reduction or contact printing. Usually the grouping of more than two negatives will be easier for reduction by camera. Having made the negatives and before spotting or retouching, place them all face down on the glass plate of the retouching stand. Examine them to see how much superfluous glass may be cut away in order to bring the diagrams close together. The nearer they are, the less waste space there is on the slide and the larger will each spot be on the screen. Then with a diamond or steel wheel glass-cutter, trim the negatives; set the pieces face down on the retouching stand, and square them up with regard to each other in a group whose vertical diameter should not, if possible, exceed its horizontal. This squaring up will be helped by inserting between the cut parts, very small bits of wood (match-sticks). Then take pieces of lantern-slide binding strips and pasting them over the cuts on the upturned glass side, fasten the parts together; cover all the separating cuts with this gummed paper. Carefully turn over the unified group and stiffen it by pasting strips over the cuts on the gelatin side; touch

out any defects with opaque, and the assembled negative is ready for camera reduction. It may happen that the members of the group vary in intensity; this may easily be cared for by varying the exposure, to be described later on. If the group is small enough for contact printing, do not paste any strips on the gelatin side (this would produce parallax in the contact printing). Be sure, when the assembled group is lying face down on the glass support, that the backs of all the parts lie in the same plane parallel to the gelatin face. The different parts may have different thicknesses; so build up the thin ones to the proper level by superposed strips of binding paper on the glass side, so that when the group is put in the printing frame, pressure on the gelatin side will affect all parts equally.

(To be continued)

SOME TEMPERATURE EFFECTS IN MICROCHEMICAL WEIGHING*

Rev. Francis W. Power, S. J.

(Abstract)

The area and volume of the beam of the Kuhlman balance were estimated by photographic and caliper measurement and from them were calculated the ideal dimensions of the beam as if it were a rectangular piece of metal. From these figures the effect of a unilateral heating was calculated and found to be less than that given in the literature but of the same order of magnitude. It is calculated that a deflection of one gamma will result from a unilateral expansion of about 56 Angstrom units, or about 1/100 the wave length of violet light.

The apparent increase in weight of the absorption tubes used in carbon and hydrogen combustion when weighed against the usual shot bottles calculates to about 6 gamma per degree rise in temperature for the anhydrone tube and about 11 gamma per degree for the ascarite tube. The corresponding figures for 1 cm fall in barometer are about 23 gamma and 40 gamma, respectively. Actual experiments, however, showed larger but rather erratic increases due to temperature rise. When this was allowed for, the observed increases in weight agreed with those calculated within a few gamma. The use of all-glass tares is recommended for this work.

*(This paper was read at the meeting of the American Chemical Society at Milwaukee, Wis., September 1938.)

METEOROLOGY

TYPHOONS ORIGINATING IN THE CHINA SEA

Rev. Charles E. Deppermann, S. J.

(Abstract)

There are at present two great, outstanding difficulties in the study of typhoon origins, remoteness of origin in regions very poorly supplied with ships and land weather stations, and the lack of adequate upper air data. Most typhoons affecting the Philippines start far to the east of us, in the vast area covered by the Caroline Islands, or in the territory between the Carolines and the Philippines, regions in fact where weather stations are very few and far between and ship reports meagre and desultory. It is disappointing also from a scientific standpoint that no typhoons and but very few depressions have ever been definitely known to arise in the Philippine Islands themselves. Hence the rather close network of stations we possess is of comparatively little use in the study of origins. Only one class of typhoons at present offers some encouragement in this regard, those originating in the China Sea. True, these storms are usually of rather small dimensions, but we are convinced that this is due, not to any essential difference between them and other typhoons, but to the fact that they very soon run into land and are consequently promptly dissipated. It is also fortunate that the China Sea is traversed by many more ships than the vast "No Man's Land" to the east of our Islands. Hence a modest study of these typhoons has been possible.

Offhand we may enumerate the following as possible causes or occasions for typhoon formation: a) frontal phenomena between air streams of different temperatures at the surface; b) pressure gradient changes on either or both sides of a front; c) topographical influence; d) convergence of air streams; e) relative humidity differences at the surface; f) upper air changes or difference of various types; g) convection in a single, homogeneous air mass. It will be the endeavor of the present paper to give data suitable to shed some light on the feasibility of some of these possible causes.

Three typhoons are presented in quite some detail with many weather maps; four additional ones are more briefly discussed and a single map given to illustrate the general air mass situation during the storm. There then follows a general table of China Sea typhoons

with information concerning the air masses involved and the places of origin. The list extends back to 1912, i.e., as far as our weather maps permit. The China Sea depressions are not here discussed, though they are quite an interesting phenomenon in themselves. However, they may be distributed into two main types: a) those which resemble the typhoon and are apparently very similar in origin and formation to the typhoon, but which do not have either the wind intensity or barometric depth enough to dignify them with the latter name; b) stationary depressions, often quite deep, which form around the gulf of Tongking.

Perfect simultaneity of observations is not found on the weather maps, it is felt that the observations are close enough in time for our limited scope. For instance, the land stations of certain regions may be one hour ahead or behind the time given for the chart. Furthermore, ship data may not be even as near synchronism as this, but whenever time discrepancies are rather marked, the time of observation is appended. In making the charts, the weather maps of the various Far Eastern observatories have been utilized, together with ship logs, privately obtained or already published. The reader should bear in mind that he is dealing with Far Eastern shipping, where both the number of ships available and the amount of information given by them can not be compared with that given by ships along the well traveled lanes of the Atlantic. An endeavor has been made to present the most salient information without making the data so voluminous that maps would demand a prohibitive size to be legible. In other words a common sense compromise has had to be made. The symbols used are those of our Philippine weather maps, and are explained in a table at the beginning of the map series. A reference map is given as Fig. A. The reader is also referred to the more extensive map given in the writer's paper entitled: "Outline of Philippine Frontology." (1)

It may be the reader's first impression that the weather maps given in this present article do not cover enough territory to show true large air masses, but the scale is larger than may at first be imagined. It must be remembered that Formosa and the Philippines combined cover a distance north to south equivalent to that from southern Florida to Maine. The China Sea is about 700 miles in width, while the distance from Manila to Guam is fully 1,590 miles. The region is therefore sufficiently extensive for our purposes. If any doubt should still remain as to the air masses, the reader is invited to study the air streams given in the "Mean Transport of Air in the Indian and South Pacific Oceans" (5) together with the daily charts of the North Pacific Ocean published by Japan. (11) He will soon be convinced of the actual existence of the air streams as given.

Then follows the data of the various weather conditions taken from ship logs of various ships in different parts of the China Sea.

Other examples are given of typhoons originating in the China Sea covering a period of nine years.

On page 21 of the monograph is a long list of references making a rather complete survey.

Table I on page 22, gives a classification of China Sea typhoons covering a period of thirty-six years.

From pages 23 to 51 are thirty-eight maps recording the weather conditions of the different land stations and ships in any way near the China Sea typhoons being studied.

Note: *Copies of this monograph may be obtained from the author or from the Bureau of Printing, Commonwealth of the Philippine Islands.*

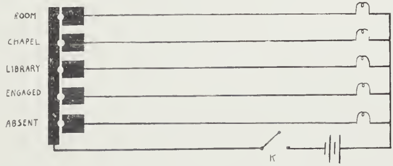
PHYSICS

Can You Do This One?

A PROBLEM IN ELECTRIC WIRING

Rev. Edward C. Phillips, S. J.

At the Gregorian University, when the new building was erected, there was installed a signal system by which the occupant of each room could enable the porter to know at any moment the whereabouts of the occupant. I give below a schematic lay-out of the system, which, though simplified, corresponds substantially with the actual mechanism as installed. Outside the door of each room there is attached to the wall a panel with circular holes into which a metal plug can be inserted: beside each hole is inscribed a "location" quite similar in arrangement to the panels found in most of our houses in the States. If a man goes to the Library, e.g., he puts the plug in the appropriate hole: this will indicate where he may be found by anyone who comes to his room to see him. But behind this panel there is a series of electrical connections, or plug switches, leading to the porter's lodge at the front door and connecting with a bank of of small electric bulbs (one bank or row for each room) and the bulb that lights up when the circuit is closed gives the porter the same information which is given to the one who goes to the occupant's door. The system is as follows:



When there is a visitor or a telephone call for the occupant, the porter closes the switch K at his switchboard and the appropriate bulb lights up—provided of course that the occupant has inserted the plug in the appropriate hole.

There are some 80 rooms provided with the indicators, the necessary wires being conducted through conduits to the porter's lodge;

this makes about 480 wires entering the porter's lodge, most of them from long distances, as the building is large: this is probably the reason why the number of "locations" was restricted to five, instead of to ten or fifteen as in our simple door panels. However the five "locations" were deemed insufficient and it was determined to increase them. It would have been very costly to re-wire the whole system, so it was decided to increase the number of locations as far as this could be done *without increasing the number either of the wires in the circuit or of the indicator bulbs,* and without undue complications in the switch system? z

Quaeritur: How many locations are practical under these limitations and how was the increase secured?

It seems only fair to answer here the first part of the question, leaving the answer of "how" to the ingenuity of our readers.

The number of locations was increased to 9.

Send in your answers to the office of the Editor.

The correct answer will be published in the next issue of the Bulletin.

AGING AND TEMPERATURE CHANGES IN STANDARD CELLS

Rev. Henry M. Brock, S. J.

As is well known, the unsaturated type of Weston standard cell is the one commonly used in the laboratory on account of its extremely small temperature coefficient. As the electromotive force cannot be reproduced as exactly as that of the normal cell, its value for some specified date and temperature is supplied by the maker. Recent certificates of the Weston Electrical Instrument Corporation state that "the electromotive force of standard cells decreases slightly with use and time. For purposes of instrument standardization the error produced by this change is negligible during many years' use if the cell is properly used." It is well to have a cell recalibrated at intervals of at least a few years especially if it is to be used for precise work. We have three cells here at Weston which illustrate this aging effect and give some idea of its magnitude.

Cell No. 4468 was purchased from the Weston Company in 1921

and has been used regularly since then. In 1929 cell No. 6955 was purchased from the same company to serve mainly as a laboratory standard to check other cells for student use. In 1930 the department of chemistry purchased cell No. 56967 from the Eppley Laboratory of Newport, R. I. The electromotive force of these cells at different dates is given in the following table·

Cell	Date	E.M.F.	Temp
#4468	April 20, 1921	1.01869 (A)	22°
	Sept. 26, 1925	1.01852 (A)	23°
	April 1929	1.01842 (C)	c22°
	Jan. 10, 1938	1.01806 (C)	20.5°
#6953	March 29, 1929	1.01861 (A)	23°
	Nov. 30, 1937	1.01817 (A)	23.5°
#56967	Feb. 8, 1930	1.01881 (B)	22°
	Jan 10, 1938	1.01848 (C)	20.3°

(A) indicates the value given by the Weston certificate, cell No. 4468 having been recertified in 1925 and cell No. 6933 in 1937. (B) is the Eppley certificate value and (C) is the value determined by comparison with cell No. 6953 just after it had been recertified. This comparison was made with a Leeds & Northrup Type K Potentiometer. Of course no general conclusions can be drawn from the limited data of only three cells. They all show a decrease of voltage with time of about the same magnitude, the change per year for the first being 38, for the second 51, and for the third 41 microvolts. It may only be a chance effect that the cell which has been used the least has the largest annual change. Cell No. 4468 has had the longest history. Its voltage has been plotted against the time. The points lie fairly closely along a straight line indicating a linear decrease of about .004% per year. The equation of this line is $e = 1.01872 - 0.000038t$ where t is the time in years beginning Jan. 1, 1925. The electromotive force of this cell can be obtained from the plot or equation for any time in the past and presumably for several years in the future barring accidents. In using a cell with an old certificate it would seem advisable to obtain some estimate of its aging coefficient and make the necessary correction. If this is not possible without a recalibration a correction of 0.00004 volts per year would doubtless give a more reliable value than that indicated by the certificate. Such at least is the case with our cells.

Cells are usually certified for about 22°C. Slight deviations from this value produce negligible effects. It is recommended not to expose them to temperatures above 40° or below 4°C. A cell may be chilled for a time, in winter for example, if kept in a room without heat or during transit to or from a testing laboratory. The question may

then arise whether or not any permanent change is to be suspected. The following data from a recent letter of the Weston Company may be of interest in this connection.

If a cell is cooled to 4°C the electrolyte becomes saturated and we have theoretically the equivalent of a normal cell with an electromotive force of 1.0183 volts and a temperature change of about 50 microvolts per degree. When returned to room temperature it will come back to its original electromotive force at least after 24 hours. Even temperatures near the freezing point do not ordinarily produce any permanent change. Some of their cells were cooled to—.16°C which is the cryohydric point for cadmium sulphate. This produced a change of at least 0.5%. Yet when they were returned to room temperature they recovered their initial electromotive force to within 0.03% after 3 hours and to within 0.01% after 48 hours. From this it appears that one need not fear any permanent ill effects from any accidental chilling of a cell. No information was requested regarding the effect of temperatures above 40°. They are likely to be rare in a laboratory. However if a cell were exposed to direct sunlight for a long time on a warm day it might warm up to 40° and even more so it is well to provide against this possibility.

GRAVITATION

GRAVITY SURVEY OF THE PHILIPPINES

Father Pierre Lejay, Director of the Zikawei Observatory, Shanghai, arrived in Manila on January 27th to make a special gravity survey of the Islands. He is using the special pendulum of his own make with which he has made similar surveys in China, Indo-China, Dutch East Indies, the Syrian desert and other regions. So far he has made one trip which took him to Cuyo Islands, Culion and Palawan. He then went through Northern and Western Luzon. He said that the survey of the mountain region of northern Luzon was the most interesting he has made at any time. In one section he found the greatest gradient in the values of gravity of which he has any knowledge.

He is now off on a short trip through the central plain of Luzon. This will be followed by a survey of southern Luzon, then southeastern Luzon, and then a trip through the Visayas and Mindanao. The trip through the Visayas may be made on a boat of the Coast and Geodetic Survey which is making an inspection of harbors.

The National Research Council of the Philippines has made a grant of $3000 to cover the expenses of the survey.

NOTES FROM THE MANILA OBSERVATORY

May 31, 1938.

Father Edmund J. Nuttall resigned his position as Chief of the Astronomical Division of the Weather Bureau to become Professor of Physics in the Ateneo.

This change necessitated that Father Depperman take over the supervision of the Astronomical Division in addition to his regular duties as Assistant Director of the Weather Bureau. Father Depperman was in the midst of a research program in meteorology with special reference to typhoons which was receiving wide attention and high praise, especially from the meteorologists of the United States. This program will now have to be curtailed, if not entirely abandoned, which will be a great loss to the prestige of the Observatory.

June 5, 1938.

Father Jose Coronas died in St. Paul's Hospital as a result of a blood clot. He had been operated upon for hernia on May 13th and was recovering from this when complications set in. Fr. O'Beirne administered the last sacraments. Father Coronas worked in the Observatory as a scholastic from 1894 to 1901. After theology in St. Louis and Tertianship in Florissant he returned to the Observatory and held the post of Meteorologist from 1907 until 1931. Since that time he has devoted himself to the ministry.

June 6, 1938.

Father Pierre Lejay, Director of the Zikawei Observatory, Shanghai, left Manila after completing a gravity survey of the Islands. He made more than 200 observations and found some interesting anomalies. His results showed correlation with the geological reconnaisance made by Bailey Willis of Stanford University, two years ago, and with the determination of earthquake epicenters which have been made by Father Repetti during the last ten years. Father Lejay's report has not yet been published.

June 6, 1938.

Father Selga, Director, went to southeast Luzon to observe the eruption of Mayon volcano. He returned to Manila on the 10th. It is expected that he will write a report on the eruption.

June 13-14, 1938.

The Observatory was visited by the officers and cadets of the Siamese naval training ship, "Mei Klong". About four years ago two officers of the Siamese navy spent a year and a half in the Observatory studying meteorology.

June 20, 1938.

Father Gherzi, meteorologist and seismologist of the Zikawei Observatory, Shanghai, visited the Observatory. He is on his way to Holland on the "Victoria" which stopped for a half day in Manila.

June 18, 1938.

Father Repetti was reelected Chairman of the Section of Seismology of the National Research Council.

NEWS ITEMS

FORDHAM UNIVERSITY. Physics Department

Dr. Hess, Nobel prize winner in 1936, has been added to the staff of the Physics Department. He will lecture on Cosmic Rays and Radioactivity.

The following papers have been published by the members of the department:

A New Theory of the Earth's Core.......................................J. J. Lynch, S.J.
Journal of the Royal Astronomical Society of Canada, May-June, 1938.

The Earthquake of November 14, 1937.............................J. J. Lynch, S.J.
Bulletin of the Seismological Society of America, July, 1938.

Traffic and Other Local Disturbances Registered at Fordham by the Vertical Benioff ....William A. Lynch
Bulletin of the Seismological Society of America, July, 1938.

The Earth's Pulse ....J. J. Lynch, S.J.
The Scientific American, December, 1938.

Biology Department

The graduate department has at present 11 Ph.D. and 14 M.S. candidates, working in Zoology, Botany, Cytology, Bacteriology and Entomology.

Dr. John E. Kouba, Jr., our former Instructor is now on the staff at Canisus College.

The courses in Biology formerly given at the School of Pharmacy are now absorbed in the College courses so that all Courses in Biology are now taught in Larkin Hall.

In our graduate seminars the following topics will be discussed: Fungus disinfection; Internal changes during chrysalis stage of holometabolous insecta; The head of Vertebrates; Recent advances in plant anatomy; The process of ossification; Soilless growth of plants; Mast cells; Taxonomic concepts; Parasites of fishes; Coloration of insects; Vital staining; Transplantation experiments; Results of Drosophila studies; and The Nucleus.

BOSTON COLLEGE. Physics Department

Dr. Hans Reinheimmer has joined the Physics faculty. He received his Ph.D. at the University of Bonn and is giving the courses in Spectroscopy. There are eight Graduate Students registered in Physics this year.

The new laboratory apparatus acquired this year includes a General Radio 713-B Beat Frequency Generator, covering a range from ten cycles to forty thousand cycles. This instrument gives a sine wave output and affords frequency standards in the above ranges. We now have standards of inductance, frequency, capacity and resistence for use in student research. To measure the temperature of incandescent bodies we have a new Leeds and Northrup Optical Pyrometer with a filter for two ranges. A new pressure operated microphone with an auxiliary amplifier has been added for sound field measurements. A differential galvanometer for harmonic analysis and a special multi-range milliammeter for twenty-five kilocycle work have been added to the instruments.

The Boston College Radio Station W-1PR has acquired a new twenty watt general purpose transmitter which will be operated as a radio telephone on the five and ten meter bands. The main transmitter with a power of 100 watts operates on the twenty meter band. A National FB-7 is used as the receiver of ten meters and up, and a National 1-10 receiver is used for all frequencies from one to ten meters. The students of the Radio Club would be glad to make a schedule with any of our colleges.

Fr. Tobin, Secretary of the New England Section of the Catholic Round Table of Science, announced that Boston College would be the host for the seventh meeting to be held on December 10th.

HOLY CROSS COLLEGE. Chemistry Department

Course in Glass Blowing: Our course in glass blowing has been received favorably by the students and has been arousing much enthusiasm. Our stock of tools for shaping the glass in various ways has been growing steadily. We have recently installed a lathe next to our glass blowing table for quantity production of beads and lips on the different kinds of apparatus we have been making. Thus far this year we have set up a Kundt tube for the Physical Chemistry Laboratory and we have also blown some Effusion Apparatus, Tubes for Hydrogen Iodide Equilibrium Measurement, Hempel Columns, Manometers, besides doing considerable repair work. The following excerpt from the Worcester Engineering Society News Bulletin tells of a demonstration we are running as part of our program:

On November 8th, Mr. William T. Levitt, President of Tamworth Associates Inc., gave a lecture on: Laboratory Glassware—Past and Present. After the lecture he gave a demonstration of glass-blowing. The lecture and demonstration were very practical and instructive.

The program of the Seminars for recent advances in chemistry was arranged for the scholastic year 1938-1939. The subjects include: History of Chemistry, Inorganic Synthesis, Thermodynamics, Advanced Organic, Reaction Rates, Analytical Chemistry, Colloidal Chemistry, Physical Chemistry, and Ultimate Organic Analysis. The first meeting was held on October 1, and they will continue until March 5th, 1939.

LOYOLA COLLEGE, Baltimore, Md. Chemistry Department

On October 27th, Dr. C. J. Copley, Automotive Engineer for the Standard Oil Company of New York, lectured to the members of the Loyola Chemists' Club on the subject: The Chemical and Physical Properties of Lubricating Oil.

Dr. Edgar B. Starkey, Assistant Professor of Chemistry at the University of Maryland, gave an interesting lecture on the topic: New Compounds of Fluorine, and Their Application in Pharmacology.

The Loyola Chemists' Club is now in its tenth year. The program for the present scholastic year is completed.

Physics Department

The Reverend John P. Delaney, S. J., Professor of Physics, has been notified of his elevation from membership to fellowship in the American Association for the Advancement of Science.

ST. PETER'S COLLEGE. Chemistry Department

Mr. J. Kenneth Smith, M S. joined the staff this year as Professor of Analytic Chemistry. He was formerly at St. Joseph's College, Philadelphia. He replaced Mr. Herman F. Schwarzenbach, who left in February, and whose place had been temporarily filled for the second semester.

Two articles on the Catalytic Properties of Charcoal appeared in the October issue of the Journal of the American Chemical Society. These were the result of the research done by four graduate students for their respective theses for the degree of Master of Science in Chemistry, and were prepared under the direction of Dr. Claude R. Schwob, Professor of Physical Chemistry.

Two new undergraduate courses were introduced this year, a one semester course in Colloids, and a one semester course in Biochemistry, the former for the first semester and the latter for the second semester. Both courses are open to Juniors and Seniors majoring in Chemistry, or taking a Pre-medical course. There are 205 students in the chemistry department.

CHINA. Two Jesuit Scientists

Rev. Emile Licent S.J., founder and Director of the famous Museum of Natural History (Hoang ho-Pai ho) connected with the Hautes Etudes in Tientsin, recently passed through Hong Kong on his way to Europe. Fr. Licent takes with him a vast collection of the entomological and botanical specimens which he collected during the past twenty-five years in various parts of North China. The specimens will be taken to France in order to complete the classification, and it is thought that not a few will be found to be completely new, in the sense that they have never been classified.

Fr. Licent, a recognized authority in entomology, concentrated on scientific investigation since his arrival in China a quarter of a century ago and has had the happiness of seeing the museum he founded develop beyond his fondest expectations. There are at present four scientists connected with the establishment, and a fifth, Rev. Peter Leroy S. J., who has been specializing in zoology in France, is expected to arrive in Tientsin. The other four are Fr. Licent himself, Fr. Maurice Trassaert S.J., a specialist in Paleontology, Fr. James Roi S.J., Botany, and Fr. Teilhard de Chardin S.J.

The museum recently received specimens of the skulls of the "Peking Man", one complete sample of which was restored by Dr. Weidenreich himself. This museum is thus the only place in China outside Peiping which possesses these relics, while other samples are to be found only in London, New York and Philadelphia.

Father Teilhard de Chardin, noted paleontologist recently returned to Peiping after four months research work in Central Burma. Fr. de Chardin, who has been connected with the Cenozoic Laboratory there since its foundation in 1929, undertook the Burma expedition in company with Professors De Terra and Movius at the invitation of Harvard University.

In the course of their explorations in the Irrawaddy basin and Shan Plateau near Mandalay, the three scientists discovered many stone implements which are of decisive importance in fixing the ethnological relationship of the early Burmese. It is thus established that there existed a close similarity between the primitive industries of Central Burma and those of Java and India.

At the conclusion of their explorations the scientists made a brief visit to Java to compare their findings with the latest scientific discoveries in that island. The archeological relics which they gathered are being forwarded to the Harvard Museum.

BOSTON COLLEGE. Chemistry Department

A new library for the use of the undergraduate students has been opened by the chemistry department on the fourth floor of the science building next to the General Chemistry laboratory. While the graduate library on the third floor will continue to house the bound copies

of the journals, the new library, which will be open at all times, will contain all the text-books, reference books, current technical and semi-technical journals, A. C. S. monographs, etc., which the undergraduates may consult or borrow. A magazine rack has been placed in it together with tables and reading lamps and already the library has become quite popular throughout the school hours.

The Qualitative Chemistry courses for both B. S. and Pre-Medical students have been replaced by Semi-Micro Qualitative courses. The Quantitative Organic course has been replaced by Biochemistry, also. In the graduate school two new courses are being given this year, Advanced Quantitative and Chemical Engineering.

The graduate seminars on recent advances in varied fields of chemistry opened on Friday, October 14th, and will continue through the year on alternate Fridays. These discussions are presented by the faculty and graduate students and are open to undergraduate science students of Junior and Senior.

CANISIUS COLLEGE. Biology Department

Dr. John E. Kouba has been appointed Assistant Professor of Biology. He attended Iona Preparatory School, New Rochelle, N. Y. and entered Fordham University in 1930, where he received in turn the B.S., M.S. and Ph.D. degrees, graduating in 1938. He is particularly interested in cellular physiology.

The Mendel Club program schedules eleven lectures, nine by visiting lecturers. Two lectures have already been given: Oct. 10, "The Marine Biological Laboratory at Woods Hole, Mass.", by Fr. Frisch and Oct. 24, "Body and Soul" by Dr. Henry Doll, Psycho-physiologist of the New York State Department of Health.

The weather of Buffalo being unusually pleasant this fall, we have been able to have a field trip every Saturday.

Recent publications of Fr. Frisch are:

"The life-history and habits of the Digger-wasp Ammobia pennsylvanica." The American Midland Naturalist, Vol. 19, No. 3, pp. 673-677.

"The structure and development of Ants." The Science Counselor, Vol. 4, No. 3.

"The Habits and instincts of Ants." Ibid. Vol. 4, No. 4.

The Mendel Club published its program for the scholastic year 1938-1939. An exceptionally fine program is offered for the students of the department; the regular meetings are held twice a month to May 1, 1939.

THE RICCI MATHEMATICS ACADEMY OF BOSTON COLLEGE

An enthusiastic class of Freshmen last year inaugurated, with the personal assistance of Mr. Anthony Eiardi, S.J., a mathematics club, which was named in honor of the famous mathematician and

missionary to China, Fr. Matteo Ricci, S.J. The Academy aims at stimulating the interest of its members and at giving them an opportunity to discuss their own mathematical problems with their fellows and with the faculty. In the bi-monthly meetings the students present papers on the history of mathematics and on the biographies of the men who have developed that history. A variety of practical and humorous problems, puzzles, fallacies and recreations are interspersed with the theoretical discussions of mathematical methods and operations. In addition to these talks by the academicians, the club invites a member of the faculty (usually from the science department or the mathematics department) to lecture on some pertinent subject once a month.

Over and above these mathematical advantages is the social side of the academy, which brings the mathematically-minded students into more intimate relations with one another. This makes for a spirit of good-fellowship which will certainly carry on long after the members have gained their sheepskin and when in after life their mutual friendship will be of real assistance in the advancement of original mathematics. Anent this social side the Academy is now a member of the combined clubs of colleges and universities in the vicinity of Boston. The other member clubs at present are Tufts College, Wellesley College, Northeastern University, and Boston University. These clubs hold meetings twice a year, with the respective colleges acting as host in turn. A distinguished mathematician is invited to speak at each meeting.

To encourage original work, whether historical or problematical, the Academy publishes the Ricci Mathematical Journal once a month. This is a mimeographed booklet of a dozen pages containing editorials, notices of the Academy's activities, and solutions of problems as well as papers presented at the meetings and other research articles.

This year the Academy has grown to include both Sophomore and Freshmen students. The original intention was to limit this Academy to these two years, since the higher classes have progressed sufficiently to be interested in more advanced mathematical work. However a Junior and Senior club (or clubs) will eventually be built around the present enthusiastic group as they attain these respective years. The keen interest of the founders is still apparent in the young Academy, and with the passing of the years it should expand into a vigorous unit adding materially to the advance of mathematics in the fields of college subjects.

During the summer, we acquired the Mathematics Library of the Academy of Natural Science of Philadelphia, including many valuable editions of the classical authors and several collections of rare periodicals.

NOTICE

ANNUAL MEETING

OF THE

NATIONAL ASSOCIATION

OF

JESUIT SCIENTISTS

WEDNESDAY, DECEMBER 28, 1938

AT 7:30 P. M.

CATHEDRAL SCHOOL-HALL, 807 FLOYD AVE.

RICHMOND, VIRGINIA

VERY REVEREND VINCENT S. WATERS, CHANCELLOR OF RICHMOND DIOCESE WILL PROVIDE ACCOMMODATIONS.
TELEPHONE ON ARRIVAL.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE CONVENTION

DECEMBER 26 TO 31, 1938